

COSC 202B: Data Structures & Algorithms

Spring 2024, 1 Credit

Time	TR 2:45-4:00 pm
Location	315 McGregory Hall
Instructor	Dr. Grusha Prasad gprasad@colgate.edu 304 McGregory Hall Pronouns: She/Her
Office Hours	T 4-5:30 pm; F 1-2:30 pm Or schedule a meeting via email
Important links	Course website Schedule with links to slides

Course Overview

Catalog description

This course introduces foundational methods in the design and analysis of information-processing and problem-solving techniques. Asymptotic time and space complexity are used as an evaluation framework throughout. Data structures include maps, trees, and heaps. Algorithmic approaches include greedy, divide-and-conquer, dynamic programming, and dealing with intractability. Graphs are used extensively, and important graph problems and their algorithms are examined closely.

Prerequisite: COSC 102

Co-requisite: COSC 202L

Intellectual rationale and learning objectives

The intellectual rationale and learning objectives are listed on the [course website](#).

Textbook

The required text for the course is Algorithms, 4th ed. by Robert Sedgewick and Kevin Wayne. The book can be ordered through the Colgate Bookstore. A copy is on reserve at Cooley library. The text is accompanied by [a booksite](#). Please note that the online text is not a replacement for the full text in the print book; the booksite is meant to be used as a quick reference. Code from the book and solutions to many exercises can be accessed directly from the booksite. Some additional required and optional readings are linked from the course website

Programming Language

The course will use the Java programming language for implementation. Prior to the first lab session, it is important that you:

1. Install and download VSCode + Java (see [here](#) for instructions)
2. Familiarize yourself with Java programming fundamentals (see §1.1–1.2 of the textbook for a review)

Course organization

Overview of course work and grading scheme

The course has weekly quizzes, 7 programming assignments, three midterm exams and one final exam. The dates for all of these assignments and exams are listed on the [course schedule](#). You will also be expected to actively participate in class.

Assignment	% of Grade
Programming assignments (7; equally weighted)	35%
Midterm exams (3; equally weighted)	30%
Final exam	20%
Quizzes (lowest dropped)	10%
Required reading, Participation and Reflection	~5%

Letter Grade Assignments

F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
< 60	60-62	63-66	67-69	70-72	73-76	77-79	80-82	83-86	87-89	90-92	93-99	*

Programming assignments and labs

Each programming assignment is based on a problem that is introduced during a lab session. The problem will be based on the course material and lecture sessions leading up to the lab. The structure of each lab session is as follows:

- You will work with a partner to collaboratively write up a description and analysis of an efficient solution to the problem.
- As you work, your solution will be checked by the TA and instructor. You'll be given feedback and guidance on how to improve your write-up. Your lab grade will be the grade you achieve by the end of the lab session.

- Once the write-up is complete, you will work with your partner to design the implementation of the solution as specified in the programming-assignment instructions. Try to write a detailed outline, including function declarations with documentation and unambiguous pseudocode. You can have this checked by a lab instructor or TA before you leave.

After the lab session, you will complete the implementation and testing of the program for homework, on your own. The program will be due Friday the week after lab (with the exception of exam weeks).

For every assignment, you will be provided with a compiled autograder. The tests in the autograder are mostly based on correctness, although some tests will also evaluate efficiency (for example, your solutions should scale to large problem instances). The score provided by the autograder for a given assignment will make up 90% of your homework score for that assignment. The other 10% will be based on the structure of the code, comments and test cases.

Note: any code that does not compile will get zero on the autograder component.

Exams

The exams will focus on the design and analysis of solutions to data structures and algorithms problems and will generally not focus on programming: that is, we look for clear, unambiguous explanations, but not code, in your answers. The midterm exams will happen during the lab section. They will focus on their respective sections (as indicated on the course schedule), but will naturally build on material covered earlier. The final exam will happen during the final exam slot for the *lecture* section, and will include all of the content covered in class.

No discussion of exam questions or possible solutions is permitted from the time the exam is first administered until exams have been completed by all students and returned.

Quizzes

Quizzes will be posted to the Moodle site on a weekly basis. These quizzes are intended to be formative assessments. As such, they are not timed and you are allowed to retake them as often as you would like until the posted deadline. Your final quiz score will be the average of your best scores on all the quizzes.

Participation

Active participation involves attending class, doing all of the required readings, participating in class discussions/ problem solving sessions and writing two self-evaluations. These self-evaluations are intended to help you synthesize and contextualize key skills and knowledge acquired through the course of this class, and help me improve as an instructor.

Course Policies

Academic honesty and collaboration

Beyond the discussions that happen in the lab section, you are not allowed to discuss the programming assignments or share your code with other students in any of the sections of this class. If you get help from other sources (e.g., instructors, TAs, internet, generative AI etc), you should cite the sources and the nature of help that you got at the end of your code in comments. Here are some examples of citations:

- “I ran into a bug with function X in my code. I discussed this with person Y and discovered that the source of the bug was Z.”
- “I did not understand concept X. So I conversed with chatbot A to clarify some misconceptions. I verified the insights from this conversation using websites Y (link) and Z (link).”
- “I forgot how the syntax for X worked in Java. I found the solution on website Y (link)”

If you are struggling to complete an activity—due to a lack of understanding, time pressure, personal matters, etc – please contact me. I want you to succeed, and I will do everything I can to help you. Violating the academic honesty expectations for the course (almost) always leads to a bad experience for you and me. If you are unsure what constitutes academic misconduct, please contact me as soon as possible.

Using generative AI tools

Generative AI systems (like ChatGPT), if used correctly, can serve as powerful tools for learning and idea refinement. In this course, you can use generative AI systems to learn about concepts iteratively through a conversation (much like you would have a conversation with a peer, TA or an instructor). However, you cannot ask these systems to directly give you answers or write code for you. One reason for this is because the answers that the system generates can be inaccurate (no matter how confident the system might sound). But more importantly, I believe the intellectual growth you can get from working through a difficult problem and discovering the answer for yourself cannot be replicated by just reading a pre-generated answer. Here are some concrete rules that exemplify this (but are not intended to be comprehensive):

Do NOT:

- Give the model a problem description and ask it to sketch an algorithm for you or write you pseudo code.
- Give the model the homework description and ask it to organize the code for you (e.g., generate the necessary function headers, write the main functions etc).
- Give the model a function description and ask it to generate code for you.

- Have your conversation with the model and your assignment open at the same time. Use your conversation with the AI as a learning experience, then close the interaction down, open your assignment, and let your assignment reflect your revised knowledge.

Using the AI system in ways as described above will count as **cheating** even if you cite the AI system as a source.

You CAN:

- Ask clarification questions about the fundamentals of programming (e.g., “When should I use a public vs. private method in Java?”)
- Ask for conceptual clarifications (e.g., “What is the difference between average case and best case run times?”)
- Try to work through the logic of something you don’t understand (e.g., “Why is the run time of this algorithm [describe] n^2 ?”)
- Given a problem description and your proposed algorithm and “talk” through the potential fallacies.

Note, for any of these models having the correct “prompt” is necessary. So you may have varying levels of success using these models to gain conceptual understanding, and in many cases just talking to your instructors/ TA/ peers or even doing straight up googling is likely to yield better results. If you do decide to use these models, it is your responsibility to also fact check the insights that you gain.

Remember: Policies around the use of Generative AI tools, like any other course policies, vary across different courses both within and outside the department.

Late homework

There are a lot of homework assignments in this course, and therefore once a student gets behind, it becomes increasingly difficult to keep up. Good planning is essential and starting homework early is good practice. Plan to give yourself time to step away from your work and return to it later.

That being said, I understand that life happens and plans do not always pan out. Therefore, if you anticipate requiring additional time on a homework assignment, please reach out to me in advance so we can discuss an alternative deadline. As long as you have made a good faith effort to complete the assignment by the original deadline, I am willing to offer a reasonable extension. I will be less willing to grant an extension if you wait to start an assignment until two days before it is due, repeatedly ask for extensions, etc.

Any homework that is turned in late without prior approval will receive only a maximum of 50%.

Reflect and retry

The midterm exams are not intended to be points of stress, but rather as learning opportunities where you can discover what you do not yet understand. Your final grade should reflect not just what you know when you take an exam, but also your ability to learn and improve from feedback. Therefore for each midterm you have the option to “reflect and retry”. For any questions that you answered incorrectly on the midterm, you can get back up to 50% of the points you lost on that question if you reflect on why your answer was incorrect and explain what the correct answer is. Any re-submission must be submitted **within a week** of getting your exam back.

Attendance

While missing a couple of classes is ok (cf. “life happens” in the Late Homework section), missing classes more frequently without prior approval will negatively impact the participation component of your grade. Please reach out to me in advance if you anticipate missing more than two classes. You are responsible for making up for any of the missed content on the days that you are absent either through office hours or by talking to your peers.

Anonymous feedback

If you have feedback or suggestions for how the course can be improved (or how it is going well), please share them with me at any point in the semester using [this form](#).

Unexpected Circumstances

If unexpected circumstances arise that could impact your involvement in the course (inability to attend class, complete the homework on time, etc.), please let me know as soon as possible so that we may design appropriate accommodations. Usually these accommodations will be made in consultation with your Administrative Dean.

Additionally, any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact their Administrative Dean for support. Furthermore, please notify your instructor if you are comfortable in doing so, so we may provide any resources available.

Non-Discrimination

Colgate and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. Colgate does not discriminate on the basis of race, color, sex, pregnancy, religion, creed, national origin, citizenship status, physical or mental disability, age, marital status, sexual orientation, gender identity and expression, veteran or military status, predisposing genetic characteristics, domestic violence victim status, or any other protected category under

applicable local, state, or federal law. If you have encountered any form of discrimination or harassment, including sexual violence (e.g. sexual assault, stalking, dating violence, or stalking), we encourage you to notify the Title IX Coordinator, Marilyn “Lyn” Rugg (mrugg@colgate.edu, 102 Lathrop Hall, 315-228-7288), the Counseling Center, the Chaplain’s Office, or Student Health Services.

Privacy Protection

Lecture materials and live and pre-recorded class-related materials that depict the images or voices of students are protected under the Family Educational Rights and Privacy Act (FERPA). It is a violation of federal law to share these materials with anyone outside of the classroom. In addition, all lecture and classroom materials are the sole intellectual property of the instructor. Any use or distribution of these materials requires the explicit written permission of the instructor.

Getting Help

A key to your success at Colgate, and in life in general, is figuring out what resources are available and using them to help you achieve your goals. For any homework problems or other class-related questions that you have, there are several options for getting help. Please take advantage of these opportunities!

1. Come see me during office hours (or send me an email)!
2. Go to the TA office hours.
3. Ask questions in whatever format you feel most comfortable in. If you are usually shy and prefer to ask questions outside of class, let me know if there is anything I can do to make you feel comfortable asking the question in class.
4. Form a study group with other students in the class and work together on a regular basis (note the collaboration policy above).

In addition, please be aware of the great resources that Colgate provides:

Academic Support and Disabilities Services.

If you feel you may need adjustment based on the impact of a disability, you should contact your instructor privately to discuss your specific needs. If you have not already done so, please contact the Director of Academic Support and Disability Services at 315-228-7375 in the Center for Learning, Teaching, and Research. Reasonable and appropriate adjustments for students with disabilities are determined on a case-by-case basis to ensure that members of the community with disabilities have access to Colgate’s programs and services. The director also assists students in identifying and managing the factors that may interfere with learning and in developing strategies to enhance learning.

NASC Liaison Group

NASC liaisons are a group of natural science and mathematics faculty members dedicated to providing science-interested students from underrepresented groups with mentorship, motivation, and individualized support as they navigate their paths in the sciences at Colgate. NASC liaisons do not replace the role of an academic advisor or offer formal academic advising. Rather a NASC liaison may meet one-on-one with a student to give another perspective on their academic plan; give tips on effective studying; or introduce a student to upper-class peers, alumni, or other faculty members that might be able to help them. The roles of NASC liaisons will depend on students' needs, and we encourage students to reach out for mentorship and moral support. To find out more about the group or to contact a member, visit the NASC division webpage.

Information Technology

The Information Technology Service Desk is located on the third floor of Case-Geyer Library and provides services to all students across campus. The help desk consultants assist with problems concerning email, Portal, Moodle, and problems with your personal laptops. Talk to your instructor if problems with your personal computer are affecting your ability to get your work done.

Counseling Center

College is hard and life can be hard. If you are experiencing emotional or personal difficulties, the Counseling Center offers completely confidential and highly professional services.

Administrative Deans

Each student is assigned an Administrative Dean who can advise you regarding personal and/or academic matters. Administrative deans often assist students to understand policies and procedures, navigate personal challenges, work with faculty, and engage with parents.